splintered parts are bright, lustrous, and non-ochreous, exactly resembling in the fractured parts the bright and unabraded implements. This fact appears to me to demonstrate that the abraded ochreous implements acquired their ochreous crust elsewhere, and were objects of great antiquity when the Canterbury gravels were laid down. I have one of these deep-brown greatly-rolled flint implements that was found amongst chert in the famous pit at Broom, near Exeter: the deep ochreous colour was not derived from chert gravel. From whence have these generally massive, abraded, ochreous implements been derived, and how laid down in distinct deposits?

As an instance of very high implementiferous gravels, the same distance south of London as the Ware gravels are north, the ancient gravels on the escarpment of the hills north of Sevenoaks and Ightham may be cited. Some of these heights exceed by 200 feet the heights of the Hertford and Ware positions.

Dr. John Evans, in his admirable book on the "Ancient Stone Implements of Great Britain," pp. 531-532, records the important discovery (on the surface) of ochreous and abraded implements at great heights near Currie Wood, a few miles south of St. Mary's Cray, Kent, at 300 feet above the valley of the Darent, and 500 feet above the sea. Dr. Evans also says (p. 531), "It is, however, necessary that further discoveries should be made in this district before it will be safe to speculate on the origin of these gravels and their relation to the superficial configuration of the neighbourhood." My friend, Mr. Benjamin Harrison of Ightham, has during the last year instituted a rigorous search over the high level gravels south of this district. A tributary of the Medway rises at Ightham, near Sevenoaks; the level of the present stream near the village is 254 feet, and an outlying bed of old river-gravel is found at 330 feet, and another bed up the stream at an altitude of from 380 feet to 400 feet. In these high-level Wealden gravels Mr. Harrison has recently found palæolithic implements *in great numbers*, generally massive, ochreous, and abraded. At 312 feet he has found them *in situ*, and on the surface as high as 335 feet. More recently Mr. Benjamin Harrison has examined the old river gravel at Dunk's Green (two miles and a half south of Ightham), and here at a level of 200 feet has proved the beds to be implementiferous. For these facts and heights I am indebted to Mr. Harrison, who has given me his permission for their publication.

In these two letters I have chiefly confined myself to statements of dry facts, purposely abstaining from any comments on the meaning of the heights, &c., referred to.

WORTHINGTON G. SMITH

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Naval Cadet Examinations

I WISH to bring to your notice the injudicious severity to which our competitive examinations have of late attained, regardless, as it appears to me, of the possible injury they may inflict on the health of those who are forced to strain every power, both physical and mental, in the struggle.

The most recent example of the kind is, I believe, the New Standard for Naval Cadetships, which requires boys from between the ages of twelve and thirteen and a half to pass a competitive examination in Latin, French (both translating and speaking), arithmetic up to decimal fractions, algebra, including fractions and simple equations with one unknown quantity, geometry up to first twenty-six propositions of Euclid, English—with Scripture history. They are further tempted, if ambitious, to take algebra up to quadratic equations, and geometry up to the end of the first book of Euclid.

Now when the object to be obtained is no less than a career for life, one can imagine what a force of pressure—from the parent anxious to provide for his son, from the schoolmaster's pride in his pupil, and from the boy's own ambition—is brought to bear to urge nature to the utmost in the trial.

The casualties—for we are entitled to use the expression—that have already occurred under the system have been sufficiently numerous to make any one who will pause to think seriously anxious.

Education is most valuable, but when its attainment is at any time carried out at the expense of health to the pupil it is a failure. "Mens sana in corpore sano" is above everything to be prized, and he who enters upon life's work possessed of that advantage is fittest for its trials.

I will quote an extract from the *Lancet*, which treats the subject from a professional point of view and with an admirable clearness. It says:—

"There can be no room to question the extreme peril of 'over-work' to growing children and youths with *undeveloped* brains. The excessive use of an immature organ arrests its development by diverting the energy which should be appropriated to its growth, and consuming it in work. What happens to horses which are allowed to run races too early happens to boys and girls who are over-worked at school. The competitive system as applied to youths has produced a most ruinous effect on the mental constitution which this generation has to hand down to the next, and particularly the next-but-one ensuing. School-work should be purely and exclusively directed to development. "Cramming" the young for examination purposes is like compelling an infant in arms to sit up before the muscles of its back are strong enough to support it in the upright position, or to sustain the weight of its body on its legs by standing while as yet the limbs are unable to bear the burden imposed on them. A crooked spine or weak or contorted legs is the inevitable penalty of such folly. Another blunder is committed when one of the organs of the body—to wit, the brain—is worked at the expense of other parts of the organism, in face of the fact that the measure of general health is proportioned to the integrity of development and the functional activity of the body as a whole in the harmony of its component systems. No one organ can be developed at the expense of the rest without a corresponding weakening of the whole. These faults of 'training' attain their supreme height of folly and short-sightedness when they are committed in reference to the youths destined for the public services. They are especially illustrated by the 'Regulations respecting Naval Cadets' just issued, and which will take effect in June of the present year. The work of the Civil Service Commissioners in respect to these classes of the possible servants of the State is personally and racially *destructive*. Sooner or later public opinion must recognise this fact, and then perhaps the Government or the Legislature may be moved to interpose—not before, but when it is too late."

We live in an age of reactions, when ideas are hastily adopted, hurriedly brought into practice, and fanatically adhered to. I can only hope that public opinion will recognise the danger that the *Lancet* so clearly points out, and that the Government may interpose before it be "too late." J. D.

Flame-Length of Coal-Gas

I HAVE recently measured the flame-length of a sample of coal-gas burning in air and burning in nitrous oxide (N_2O). The flame-length in air was $\frac{13}{10}$ths of an inch and $\frac{5}{10}$ths in nitrous oxide. The relation of 5 to 13 is very close to what my theory would suggest, and is a confirmation of my law published in your issue of April 7.

I might add that I have recently noticed the flame of a mixture of hydrogen and nitrous oxide burning in air to develop a bright white spot about one-third from the top of the flame, and when the proportion of nitrous oxide is larger, to extend into a cone reaching to the jet. I have not examined this flame with a spectroscope, but am certain, from the whiteness of the flame, that the spectrum would be continuous. LEWIS T. WRIGHT

Water in Australia

A GENTLEMAN recently returned from Australia believes that the arid plain which occupies the centre of that island-continent might be amply supplied with water and converted into rich farm land by a very simple process. He founds his belief upon observed facts in the three sciences of botany, physiography, and geology, thus:—

1. Gum-trees and the mallee scrub flourish there. The gum-trees grow to a great size and withstand the drought of many summers. They must have water; whence do they obtain it?
2. Rivers which flow towards the centre from the mountain ranges along the coasts have no apparent outlet into the sea, but are lost in the desert. What becomes of them?
3. The underlying rock of the central plain is an almost horizontal bed of Tertiary Sandstone.

The conclusion is that the Sandstone is saturated with water and forms an immense reservoir from which existing trees draw their supplies by deep tap-roots, and that by sinking wells in the desert this water could easily be reached.

The author of this theory, wishing only to confer a public benefit, desires to bring it under the notice of scientific men,

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that it may be either turned to account or shown to be erroneous. If there is even a remote possibility of its truth it would seem worth while for one or more of the Colonial Governments to have borings made in order to test it. F. T. MOTT

Birstal Hill, Leicester, May 5

The Glacial Blocks of Zinal

MAY I through your columns express a hope that other qualified observers will volunteer to take charge of work such as I propose to do this summer as my share?

This is to mark the position of large blocks of stone on the glacier of Zinal. You will, I hope, receive the report of my friend, Prof. F. A. Forel, upon periodical variations of glaciers. Therein are sketched some of the existing data. I have for years much wished to organise a simultaneous action. With a Galton's pocket altazimuth, a pot of paint, and the superb map on the scale of $\frac{1}{50000}$ of the Swiss Alpine Club (Sheet III. of the Valais du Sud), it will be a pleasant and not a difficult task to lay down a few good triangles, and to paint a letter and indication of bearings of stones along and athwart the great glacier, with which I am well acquainted. The Swiss Alpine Club has erected a hut at Les Mountets, which, at about 9500 feet above sea-level, will form a capital base of operations. The pre-eminently grand scenery would itself reward the short sojourn necessary for our purpose. To secure uniformity of action and registration I propose that we should place ourselves in communication with M. F. A. Forel. I shall be very glad to hear from gentlemen—at this address up to the end of June, and then at the Hôtel d'Anniviers, Vissoie sur Sierre, Canton Valais, the most comfortable quarters in the Val d'Anniviers, about 4000 feet above sea-level, three hours' and a half drive from Sierre railway station.

I would suggest, as good head-quarters and interesting fields of observation: (1) the hotel at the Riffelberg, with the Gorner and Findelen glaciers; (2) the hotel at Saas in Grund, with the Fée and other large glaciers in the Saas-Thal; (3) the hotel at the Maltmark See, with the Allalin and Schwartzberg glaciers; and (4) Macagnaga as a southern station. I myself, also, ask for personal assistance. MARSHALL HALL

Villa Chessex, Veytaux-Chillon, Canton Vaud,
Switzerland, May 3

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AT ALGIERS[1]

III.

THE main result of the Algiers Congress has undoubtedly been the acquisition of a considerable amount of matter tending to the development of the great French colony, while at the same time it has been the means of making hundreds of Frenchmen well acquainted with the principal features—physical, geographical, and political—of a country which they knew previously only by name. The general results, as far as universal science is concerned, have been slight, but we cannot regard the Congress as less than a success. It is as if the French had said to the world of science, "Come and see this undeveloped country, and help us to apply each and all of the sciences to its special requirements, to aid us in a more perfect colonisation." The work has been nobly initiated by the French. It is probable that not less than a hundred millions sterling have been expended in the country. The roads and bridges, and telegraph and postal systems are perfect. Everywhere you find evidences of complete organisation. Every small village has its mayor and council; its post-office and diligence service; its water supply and sanitary arrangements; its groves of eucalyptus-trees and trimly-planted streets. Let us take one example—that of Bordj-Menaïel, a village to the east of Algiers, which we visited in the course of an excursion. Twenty-three years ago Bordj-Menaïel was made a centre of colonisation, and 1718 hectares of land were distributed among the first colonists. The total superficies of the commune is 4200 hectares, and it contains a population of 837, of whom 659 are Europeans and 178 indigenous races. Situated at a distance of 70 kilometres from Algiers and 38 from Dellys, it is traversed by the main departmental road passing to Eastern Algeria. It stands in the midst of a highly fertile alluvial plain, 28 metres above the sea, and is watered by the Isser. This commune possesses the following municipal officers: mayor, deputy-mayor, justice of the peace, sheriff's officer, receiver of "contributions diverses," a recorder of the census, a manager of ponts et chaussées, a departmental business agent, a bureau of posts and telegraphs, a "médécin de colonisation," a midwife, and a pharmacien. Its spiritual and intellectual wants are provided for by a *curé* and two schools. Since 1873 a brigade of gendarmerie has been stationed in the village. The organisation appears excessively elaborated for so small a population; but we must remember how doubly necessary such arrangements become in a new colony, which without sufficient proofs of the strong arm of the law would speedily become lawless, and without the benefit of well-directed and properly enforced municipal arrangements would form an ill-regulated and degenerating community. The bureaucracy evidently enters largely into the French system of colonisation.

At the present moment a project is before the Chamber for the completion of the colonisation of Algeria by the creation of 300 new villages, which, like Bordj-Menaïel and the existing villages, are to be built and thoroughly organised before colonists are invited to accept the grant of land in the commune and take up their abode in the village. Such of the existing villages as we saw were of one and the same type: the church and water-supply in a central square, from which two or more streets proceeded; the mairie, a few shops, one or more inns, and a post-office. In some villages—Palestro, for example, many of the inhabitants of which were massacred by the Kabyles so recently as 1871—there was a large space, surrounded by a high wall furnished with loopholes, in which the inhabitants could take refuge in the event of a sudden descent of the natives. Many of the colonists are Alsatians or Lorrainers who emigrated at the close of the Franco-Prussian war. They all appeared happy and contented, and their farms and gardens were flourishing. Their worst enemies are drought and fever; the former is being provided against by new systems of irrigation, and the latter by the planting of thousands of eucalyptus-trees. At Blidah we found a perfect example of the most developed system of irrigation. A ready supply of water is obtained during many months of the year from the mountains, and this is led by small brick-lined watercourses through the gardens. A main watercourse passes a line of houses, the garden walls of which are furnished with small trap-doors by which at any time a portion of the stream can be diverted into the garden. Of course rain is always looked for with great anxiety, specially between the months of May and September, when the grain crops are wholly dependent upon it. In the south of Algeria there exist at this moment places where no rain has fallen for *six years*, and of course any attempt at cultivation is here impossible.

Towards the end of the Congress several of the sections showed greater vitality than at the commencement. In the section of Mathematics there was for the first time a fair show of papers, for the most part devoted to pure geometry. The foreign mathematicians—Leguine of Odessa, Oltramare of Geneva, and Fiedler of Zürich—contributed their quota. M. Trépied brought forward a project for the construction of an observatory at Algiers. M. Picquet has been elected president of this section for next year. In the section devoted to Civil Engineering the most important papers were by Col. Fourchault on defensive villages, and by M. Trémaux on irrigation. M. Gobin is president for next year. In the Physical section papers were read by M. Gaussen on photometric photography, and by Prof. Tacchini on the solar protuberances.

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[1] Continued from vol. xxiii. p. 607.

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